WHAT IS CLAIMED IS:

1. An isolated nucleic acid comprising a nucleotide sequence encoding a mutated human synuclein protein or homologue thereof.

2. The isolated nucleic acid of claim 1 wherein said mutated synuclein protein is selected from the group consisting of alpha, beta and gamma synuclein proteins.

3. The isolated nucleic acid of claim 2 wherein said mutated synuclein protein is the alpha synuclein protein.

4. The isolated nucleic acid of claim 3 wherein said nucleotide sequence contains at least one mutation at base pair position 209.

5. The isolated nucleic acid of claim 4 wherein said mutation at position 209 is a change from guanine to adenine.

6. The isolated nucleic acid of claim 5 having the sequence given in SEQ ID NO. 1.

7. An oligonucleotide complementary to a portion of the synuclein gene, wherein said portion comprises a mutation associated with predisposition to Parkinson's Disease.

8. The oligonucleotide of claim 7 wherein said mutation is at base pair position 209 in the synnuclein gene.

9. The oligonucleotide of claim 8 wherein said mutation is a change from guanine to adenine.

10. A vector comprising the isolated nucleic acid of claim 1.

11. A host cell comprising the vector of claim 10.

12. A method of affecting characteristics of Parkinson's Disease, comprising of expressing nucleic acids which are implicated in disease development in cultured cells through the use of expression vectors.

13. The method of claim 12 wherein the said nucleic acid is selected from the group consisting of alpha, beta, and gamma synuclein genes.

14. The method of claim 13 wherein the said nucleic acid encodes the mutated alpha synuclein protein.

15. The method in claim 14 wherein the said mutated alpha synuclein protein contains at least one mutation at base pair 209.

16. The method of claim 15 wherein said mutation at position 209 is a change from guanine to adenine.

17. An isolated human synuclein protein or peptide containing at least one mutation.

18. The isolated human synuclein protein or peptide of claim 17 wherein said protein or peptide is selected from the group consisting of the human alpha, beta and gamma synuclein proteins or fragments thereof.

19. The isolated human synuclein protein or peptide of claim 18 having the sequence given in SEQ ID NO 5.

20. The isolated human synuclein protein or peptide of claim 19 wherein said protein or peptide is the alpha synuclein gene or a fragment thereof.

21. The isolated protein or peptide of claim 20, wherein said mutation is at amino acid position 53.

22. The isolated protein or peptide of claim 21, wherein said mutation is an alanine to threonine substitution.

23. An antibody specific for the protein or peptide of claim 17.

24. A method of detecting subjects at increased risk for Parkinson's Disease, comprising:

obtaining a sample comprising nucleic acids, proteins or tissues from the subjects, and

detecting in the nucleic acids, proteins or tissues the presence of a mutation which is associated with Parkinson's disease,

thereby identifying subjects at increased risk for the disease.

25. The method of claim 24 wherein said mutation is located on human chromosome four.

26. The method of claim 25 wherein said mutation is located in the alpha synuclein gene.

27. The method of claim 26 wherein said mutation causes an amino acid substitution at position 53.

28. The method of claim 27 wherein said mutation causes an alanine to threonine substitution at position 53.

29. The method of claim 24 wherein said detecting step comprises combining a nucleotide probe which selectively hybridizes to a nucleic acid containing said mutation, and detecting the presence of hybridization.

30. The method of claim 29 wherein said nucleotide probe is an oligonucleotide complementary to a portion of the synuclein gene, wherein said portion comprises a mutation associated with predisposition to Parkinson's Disease.

31. The method of claim 30 wherin the mutation of said oligonucleotide is at base pair position 209 in the alpha synuclein gene.

32. The method of claim 31 wherein the mutation of said oligonucleotide is a change from guanine to adenine.

33. The method of claim 24 wherein said detecting step comprises amplifying a nucleic acid product comprising said mutation, and detecting the presence of said mutation in the amplified product.

34. The method of claim 33 wherein said detecting step comprises selectively amplifying a nucleic acid product comprising said mutation, and detecting the presence of amplification.

35. The method of claim 34 wherein said amplifying step comprises at least one annealing step whereby at least one oligonucleotide is annealed to said sample of nucleic acids.

36. The method of claim 35 wherein said amplifying step uses two oligonucleotides.

37. The method of claim 36 wherein said two oligonucleotides have the sequences of SEQ ID NOs 2 and 3.

38. The method of claim 24 wherein said detecting step comprises detecting the presence or absence of a restriction endonuclease site as detected by enzymatic digest of said sample of nucleic acids.

39. The method of claim 38 wherein said restriction endonuclease site is recognized by *Tsp*451.

40. The method of claim 24 wherein said detecting step comprises chain termination with a labeled dideoxynucleotide.

41. An oligonucleotide complementary to a nucleic acid sequence which flanks a mutation in the synuclein gene that is associated with predisposition to Parkinson's disease, wherein said oligonucleotide may be used in diagnostic screens in the amplification of a nucleic acid sequence comprising said mutation.

42. The oligonucleotide of claim 41 having the sequence of SEQ ID NO 2.

43. The oligonucleotide of claim 41 having the sequence of SEQ ID NO 3.

44. The method of claim 24 wherein said detection step comprises identification of said mutations with an antibody.

45. The method of claim 44 wherein said antibody is directed against an isolated human synuclein protein or peptide containing at least one mutation.

46. The method of claim 45 wherein said isolated human synuclein protein or peptide is selected from a group consisting of the human alpha, beta, and gamma synuclein proteins or fragments thereof.

47. The method of claim 46 wherein said isolated human synuclein protein or peptide has the mutated sequence given in SEQ ID NO 5.

48. The method of claim 47 wherein said mutation is at amino acid position 53.

49. The method of claim 48 wherein said mutation is an alanine to threonine substition

50. A diagnostic kit comprising the oligonucleotide of claim 41.

51. A diagnostic kit comprising the oligonucleotide of claim 42.

52. A diagnostic kit comprising the oligonucleotide of claim 43.

53. A diagnostic kit comprising the oligonucleotide of claim 7.

54. A diagnostic kit comprising the oligonucleotide of claim 8.

55. A diagnostic kit comprising the oligonucleotide of claim 9.

56. A diagnostic kit comprising the antibody of claim 23.

57. An isolated nucleic acid comprising a mutation in a human synuclein gene or homologue thereof.

58. The isolated nucleic acid of claim 57 wherein said synuclein gene is the alpha synuclein gene.

59. The isolated nucleic acid of claim 58 wherein said mutation occurs at base pair position 209.

60. The isolated nucleic acid of claim 59 wherein said mutation is a change from guanine to adenine.

61. The isolated nucleic acid of claim 60 having the sequence given in SEQ ID NO 1.

62. A transgenic animal which expresses a mutated synuclein protein, wherein said animal may be used as an animal model for Parkinson's disease.

63. The transgenic animal of claim 62, wherein said mutated synuclein protein is an alpha synuclein protein.

64. A method of screening a compound for the ability to reverse the self-aggregation of synuclein proteins, comprising exposing an aggregate of synuclein proteins to a test compound and observing whether or not the aggregate is dissolved.

65. The method of claim 64 wherein said test compound is a synuclein peptide.

66. The method of claim 65 wherein said peptide comprises a mutation.

67. The method of claim 64 wherein said test compound is an antibody.

68. The method of claim 64, wherein said observing step comprises Congo red staining, electron microscopy or CD spectrometry.

69. The method of claim 64 wherein said protein aggregate is located within an animal.

70. A method of screening a compound for the ability to inhibit the self-aggregation of synuclein proteins, comprising exposing a population of synuclein proteins to a test compound under conditions which promote self-aggregation in the absence of said compound and observing whether or not self-aggregation of said proteins is inhibited.

71. The method of claim 70 wherein said test compound is a synuclein peptide.

72. The method of claim 71 wherein said peptide comprises a mutation.

73. The method of claim 70 wherein said test compound is an antibody.

74. The invention substantially as disclosed and described.